Multilayer Varistor with FLEXITERM®

General Specifications

GENERAL DESCRIPTION
With increased requirements from the automotive industry for additional component robustness, KYOCERA AVX recognized the need to produce a MLV with enhanced mechanical strength. It was noted that many components may be subject to severe flexing and vibration when used under the hood automotive and other harsh environment applications.

To satisfy the requirement for enhanced mechanical strength, KYOCERA AVX had to find a way of ensuring electrical integrity is maintained whilst external forces are being applied to the component. It was found that the structure of the termination needed to be flexible and after much research and development, KYOCERA AVX launched FLEXITERM®, multilayer varistor. The industry standard for flexure is 2mm minimum. Using FLEXITERM®, KYOCERA AVX provides up to 5mm of flexure without internal cracking.

As well as for automotive applications, FLEXITERM® will provide Design Engineers with a satisfactory solution when designing PCB's which may be subject to high levels of board flexure.

PRODUCT ADVANTAGES
- Operating Temperature Range: -55°C to +125/150°C
- Qualified in 0603, 0805, 1206, and 1210 Case Sizes
- High Mechanical Performance Guaranteed to withstand 5mm Bend Test
- Increased Temperature Cycling Performance ≥ 3000 Cycles
- Flexible Termination System
- Reduction in Circuit Board Flex Failures
- AEC-Q200 Qualified or Commercial Grade Products Available

APPLICATIONS
- High Flexure Stress
  - e.g. Depanelization: Components Near Edges of Board

Variable Temperature Applications
- Soft Termination Offers Improved Reliability Performance in Applications Where There is a Large Temperature Variation
  - e.g. Engine Sensors: Direct Connection to Battery Rail

Automotive Applications
- Improved Reliability
- Excellent Mechanical and Thermo-Mechanical Performance

HOW TO ORDER

<table>
<thead>
<tr>
<th>VC</th>
<th>AS</th>
<th>0805</th>
<th>18</th>
<th>A</th>
<th>400</th>
<th>R</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varistor Chip</td>
<td>Automotive Series</td>
<td>Size</td>
<td>Working Voltage</td>
<td>Energy Rating</td>
<td>Clamping Voltage</td>
<td>Packaging</td>
<td>Terminations</td>
</tr>
<tr>
<td>VC = Varistor Chip</td>
<td>AS = 125°C</td>
<td>0603</td>
<td>05 = 5.6V&lt;sub&gt;c&lt;/sub&gt;</td>
<td>A = 0.1J</td>
<td>150 = 18V</td>
<td>D = 7&quot; (1000)*</td>
<td></td>
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<tr>
<td>VT = Varistor Temp Rated</td>
<td>0805</td>
<td>14 = 14V&lt;sub&gt;c&lt;/sub&gt;</td>
<td>C = 0.3J</td>
<td>300 = 32V</td>
<td>R = 7&quot; (4000)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1206</td>
<td>18 = 18V&lt;sub&gt;c&lt;/sub&gt;</td>
<td>D = 0.4J</td>
<td>390 = 42V</td>
<td>T = 13&quot; (1000)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1210</td>
<td>26 = 26V&lt;sub&gt;c&lt;/sub&gt;</td>
<td>J = 1.5J</td>
<td>400 = 42V</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>30 = 30V&lt;sub&gt;c&lt;/sub&gt;</td>
<td>580 = 60V</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>650 = 67V</td>
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NOTE: Contact factory for availability of Tolerance Options for Specific Part Numbers.

The Important Information/Disclaimer is incorporated in the catalog where these specifications came from or available online at www.kyocera-avx.com/disclaimer/ by reference and should be reviewed in full before placing any order.

TDS-TS-0036 | Rev 1

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TRANSPARENT SUPPRESSION PRODUCTS ---
PERFORMANCE TESTING

AEC-Q200 Qualification
- Created by the Automotive Electronics Council
- Specification defining stress test qualification for passive components

Testing
- Key tests used to compare soft termination to AEC-Q200 qualifications:
  - Bend Test
  - Temperature Cycle Test

BOARD BEND TEST RESULTS

AEC-Q200 Vs KYOCERA AVX FLEXITERM® Bend Test

<table>
<thead>
<tr>
<th>Style</th>
<th>Conventional Termination</th>
<th>FLEXITERM</th>
</tr>
</thead>
<tbody>
<tr>
<td>0603</td>
<td>&gt;2mm</td>
<td>&gt;5mm</td>
</tr>
<tr>
<td>0805</td>
<td>&gt;2mm</td>
<td>&gt;5mm</td>
</tr>
<tr>
<td>1206</td>
<td>&gt;2mm</td>
<td>&gt;5mm</td>
</tr>
<tr>
<td>1210</td>
<td>&gt;2mm</td>
<td>&gt;5mm</td>
</tr>
</tbody>
</table>

TABLE SUMMARY

Typical bend test results are show below:

TEMPERATURE CYCLE TEST PROCEDURE

Test Procedure as per AEC-Q200:
The test is conducted to determine the resistance of the component when it is exposed to extremes of alternating high and low temperatures.
- Sample lot size quantity 77 pieces
- TC chamber cycle from -55°C to +125°C for 1000 cycles
- Interim electrical measurements at 250, 500, 1000 cycles
- Measure parameter capacitance leakage current, breakdown voltage

KYOCERA AVX ENHANCED SOFT TERMINATION BEND TEST PROCEDURE

Bend Test
The varistor is soldered to the printed circuit board as shown and is bent up to 10mm at 1mm per second:
- The board is placed on 2 supports 90mm apart (varistor side down)
- The row of capacitors is aligned with the load stressing knife
- The load is applied and the deflection where the part starts to crack is recorded (Note: Equipment detects the start of the crack using a highly sensitive current detection circuit)
- The maximum deflection capability is 10mm
**BEYOND 1000 CYCLES: TEMPERATURE CYCLE TEST**

**FLEXITERM® TEST SUMMARY**

- Qualified to AEC-Q200 test/specification with the exception of using KAVX 3000 temperature cycles (up to +150°C bend test guaranteed greater than 5mm).
- FLEXITERM provides performance compared to standard termination systems.
- Board bend test improvement by a factor of 2 or 4 times.
- Temperature Cycling:
  - 0% Failure up to 3000 cycles
  - No significant change in electrical characteristics up to 3000 cycles

**WITHOUT SOFT TERMINATION**

Major fear is of latent board flex failures.

**WITH SOFT TERMINATION**

Far superior mechanical performance. Generally open failure mode beyond 5mm flexure.

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